Spring 2021

FED 101-026: Fundamentals of Engineering Design

Balraj Mani

ME - FUNDAMENTALS OF ENGINEERING DESIGN

FED 101 - ME TRACK

January 19, 2021 **Spring 2021**

COURSE ADMINISTRATIVE INFORMATION

Course Name:	**ME – FUNDAMENTALS OF ENGINEERING DESIGN**
Course Number:	FED 101-026 (12827)
Class meeting Room:	Asynchronous Mode – via WebEX
After Class office room:	By appointment - WebEX
Instructor's Name:	**B. S. Mani**
Instructor's Téléphone:	**(973) 596-3339 (office)**
	(630) 345-0558 (mobile - text and dial)
Instructor's e-mail id:	*mani@njit.edu*
Class meeting hours:	Friday, 07:30AM–10:20 AM (Friday :L60, R: L61)
After Class office hours:	Open time slots by appointment-WebEX
Complaints / Compliments:	Dr. Joga Rao (973) 596-5601 *i.j.Rao@njit.edu*

COURSE DESCRIPTION

Study technical graphics and the computer as a technical drawing tool;
Introduction to projections and multiview drawings and visualization;
Discuss geometry commonly used in engineering design graphics, orthographic projections;
Dimensioning techniques, tolerancing and introduction to auxiliary and sectional views;
Apply software program Creo Parametric 6.0 (previously known as Pro/Engineer/Wildfire) to various problems.

GENERAL REQUIREMENTS

- Regular Attendance to all lecture classes is required
- Paying attention to lectures during class is expected
- ALL assignments shall be submitted on schedule
- Penalty for late submission: *33.3%*
- Final (**ONLY final)** version of Creo 6.0 models shall be submitted in *soft copy to 'CANVAS' student folder*
- Reasonably equal Team Participation in Team Project is required for a grade
- Unequal Team Participation in Team Project will affect the grade of ALL the members of a team
- Team working for all general class / home work is highly encouraged
- Submission of the Final Team Project is *mandatory to receive a final course grade*
- Taking the Mid Term Test is mandatory *to receive a final grade in the course*
- Web browsing during class with links NOT connected with classwork will NOT be allowed
- IPOD use inside class room, during class will NOT be allowed
- Cell Phone or i-Phone use or T'xting during class is NOT allowed and not tolerated

contd…

- Students browsing NON-CLASS links and/or e-mail and/or other forms of text messages for non-class needs during class will be expelled from class and marked absent
- Eating and/or drinking inside the class room, will NOT be allowed (not on WebEx)
- Make-up examination, except for authentic MEDICAL reason(s), will NOT be allowed
- Students shall NOT schedule games, conferences and other activities in conflict with class schedule
- 'ZERO TOLERANCE' policy shall apply to any proven cheating with any submission

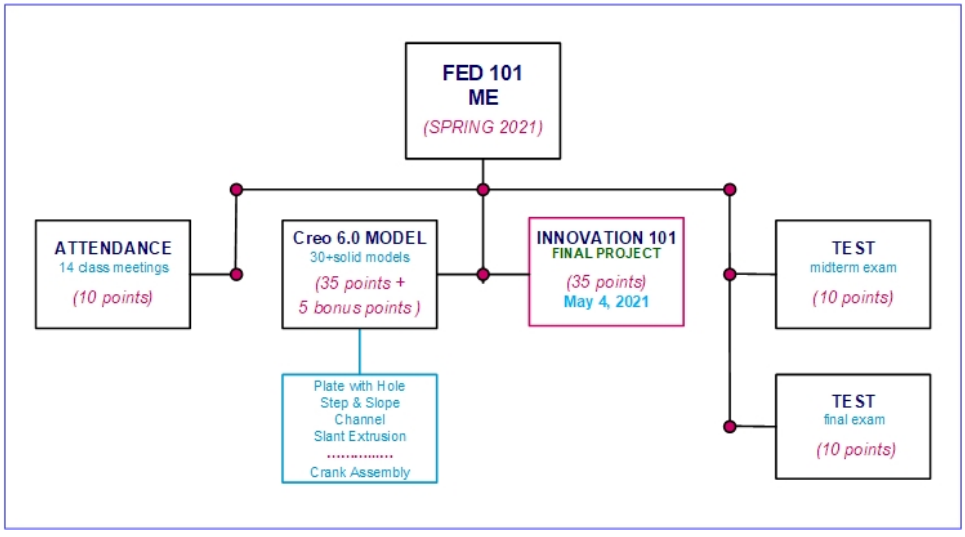
REQUIRED TEXT BOOKS

1. FUNDAMENTALS OF GRAPHICS COMMUNICATION by Gary R. Bertoline, Eric N. Wiebe et al. ISBN: 978-0-07-352263-0 (0-07-352263-5); 6th Edition, McGraw Hill 2010 (Alternatively, ISBN: 978-1259538360 – 7 th edition available as loose leaf book)
2. Creo Parametric 6.0 Tutorial by Roger Toogood ISBN: 978-1-63057-291-4, Schroff Development Corporation 2018

RECOMMENDED DRAWING AND OTHER MATERIALS

- Mechanical pencil 0.5 mm with HB and H leads, good pencil eraser (one each)
- Dedicated Flash drive, capacity ~ 2GB (one)
- **Install Creo Parametric 6.0** as soon as possible in your computer, (I assume that you have a computer)
- Digital Calipers – priced about $20
- Project report must be submitted online *(you may get a spiral bound report for yourself)*

GRADING SCHEME (SUBJECT TO CHANGE)



DESCRIPTION	POINTS
Attendance	10
Design – Creo 6.0 Models	35
Midterm Exam	10
Final Exam	10
Innovation-101 Project	35
Total	***100***

FINAL LETTER GRADE

LETTER GRADE	QUANTITATIVE REQUIREMENT	QUALITATIVE ACHIEVEMENT
A	90% & above	Superior Achievement
B plus	85% to 89.99%	Excellent Achievement
B	80% to 84.99%	Very Good Achievement
C plus	75% to 79.99%	Good Achievement
C	70% to 74.99%	Acceptable Achievement
D	60% to 69.99%	Minimum Achievement *(Pass)*
F	59.99% and below	Inadequate Achievement *(Fail)*

THEME FOR 2021

Whatever you do, do it with Passion

Teamwork will bring the success which an individual cannot working alone

PRIDE = 𝔓urpose, 𝔑esponsibility, 𝔍ndividuality, 𝔇etermination, & 𝔈xcellence

ACADEMIC INTEGRITY

- No tolerance for *cheating* in any manner in any test.
- Any student found *cheating during a test* will be awarded a course grade of 'F.'
- SEVERE PENALTY for Compromising on Creo 6.0 Parametric model and Homework assignment.
- Penalty for **EACH** Creo 6.0 Parametric Model and Homework assignment compromised:
  - A grade of 'zero' will be awarded for the compromised assignment,
  - Overall course grade will be dropped by one full grade level for each incident, and
  - The *student who compromised as well as the student who allowed will* ***BOTH*** earn the ***SAME*** penalty:
    - For example, if a student happens to copy a Creo 6.0 model from another student and submit for his (or her) assignment, if discovered, he (or she) and the student who provided the model for copying, will ***BOTH*** receive the ***SAME*** penalty.
- Please refer to the University Policy on Academic Integrity at https://www.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf

TENTATIVE LIST OF MODELING ASSIGNMENTS

#	Description	Source	Page No	Figure No	Description	Assy Item	Score	Part Number
1	Plate with Hole	Lecture			Model		1	12001XXX001
2	Slope & Step	Handout	Pg 1		Model		1	12002XXX001
3	Stop Base	Handout	Pg 2		Model		1	12003XXX001
4	Wedge Block	Handout	Pg 1		Model		1	12004XXX001
5	Channel	Toogood	3.28	40	Model		1	12005XXX001
6	Shaft Support	Handout	Pg 2		Model		1	12006XXX001
7	Plate Anchor	Toogood	3.34	--	Model	**1**	1	12027XXX001
8	Guide Pin	Toogood	4.1	1	Model		1	12007XXX001
9	Vice Handle	Toogood	4.28	--	Model	**2**	1	12027XXX102
10	Slant Extrusion	Handout	Pg 3		Model		1	12008XXX001
11	Slant Support	Handout	Pg 3		Model		1	12009XXX001
12	Dial Bracket	Handout	Pg 4		Model		1	12010XXX001
13	Pin	Toogood	5.23	1	Model	**3**	1	12027XXX103
14	Acorn nut	Toogood	5.23	2	Model	**4**	1	12027XXX104
15	Screw	Toogood	5.23	3	Model	**5**	1	12027XXX105
16	Cutter	Toogood	6.17	27	Model		1	12011XXX001
17	Disc	Toogood	6.23		Model	**6**	1	12027XXX106
18	Pattern holes-Ring	Toogood	7.11	20 & 21	2 Models		1	12012XXX001
19	Pattern-Group	Toogood	7.12	22	Model		1	12013XXX001
20	Pattern-Blade	Toogood	7.17	29	Model		1	12014XXX001
21	Pattern-Wheel	Toogood	7.18	30	Model		1	12015XXX001
22	Copy-Ears	Toogood	7.24	43	Model		1	12016XXX001
23	Copy-Cut	Toogood	7.27	49 & 50	Model		1	12017XXX001
24	Hemisphere	Toogood	7.35 & 7.36	Left & Right	Model	**7 & 8**	1	12027XXX107 & 12027XXX108
25	Bracket	Toogood	8.12 & 8.22	10 & 22	Model & Drawing	**1**	1	12026XXX001
26	Pulley	Toogood	8.28 & 8.39	26 & 40	Model & Drawing	**2**	1	12026XXX102

TENTATIVE LIST OF MODELING ASSIGNMENTS *(contd..)*

#	Description	Source	Page No	Figure No	Description	Assy Item	Score	Part Number
27	Flanged Cover	Toogood	8.44 & 8.45	--	Model	9	1	12027XXX109
28	Pulley Assembly	Toogood	9. 1	1	Assembly		1	12026XXX100
29	Pulley Assembly	Toogood	10.27	32	Assy Drg+BOM		1	12026XXX100
30	Vice Anchor Assy	Toogood	9.31	--	Sub Assembly		1	12027XXX100
31	Vice Assembly	Toogood	10.30 & 10.31	--	Assembly		1	12027XXX100
32	Vice Assembly	Toogood	--	--	Assy Drg+BOM		1	12027XXX100
33	Cap	Handout	Pg 4-5		Model		1	12018XXX001
34	Wall Bracket	Handout	Pg 5-8		Model		1	12019XXX001
35	Air Duct	Handout	Pg 9		Model+Drg		1	12020XXX001
36	*Compression Spring*	*Sample Mod*	*Sample Model*		*Model*		*1*	12021XXX001
37	*Hex headed bolt*	*Sample Mod*	*Sample Model*		*Model*		*1*	12022XXX001
38	*Wave Washer*	*Sample Mod*	*Sample Model*		*Model*		*1*	12023XXX001
39	*Rot Blend–(Mobius)*	*Sample Mod*	*Sample Model*		*Model*		*1*	12024XXX001
40	*Surf. Model-Mouse*	*Sample Mod*	*Sample Model*		*Model*		*1*	12025XXX001

GRADING RUBRIC AND CONTENT OF EACH CREO MODEL SUBMISSION

#	DESCRIPTION	Possible Score
1	Soft Copy: Final version of MODEL uploaded to CANVAS ***OR***	0.3
	Soft Copy: Final version of MODEL & DRAWING in one folder in case of drawings ***OR***	
	Soft Copy: Final version of MODEL & ASSEMBLY in one folder in case of assemblies	
2	DIP Sheet (DIPS) for the model or assembly in PDF form uploaded to CANVAS	0.2
3	Correctness of part model or assembly model or drawing	0.5

INNOVATION-101 PROJECT: REQUIREMENTS & GRADING CRITERIA

#	DESCRIPTION	POSSIBLE SCORE
0	**Work as team of 3 – *Instructor will match Team***	
1	**Create 24 (3x8) or more unique part models**	4 points
	✣ Create a dimensioned drawing for 4 or more models	
	✣ Create DIPS for four or more models	
	✣ Incorporate adequate complexity	
	✣ Use color shading	
	✣ Use parameters, material and finish in each model	
	✣ Try to use family tables, patterns, relations and sections	
2	**All part models MUST assemble into one unit**	4 points
	✣ Use exploded view and interference check	
	✣ Create a drawing for assembly with BOM & BOM balloons	
	✣ Incorporate adequate complexity	
	✣ Create DIPS for assembly	
	✣ Use relations and sections in Assembly	
	✣ Create animations where possible (optional)	
3	**Report submitted - spiral bound:**	5 points
	✣ Report must be spiral bound with transparent cover	
	✣ Table of contents and page numbers	
	✣ Product description	
	✣ Creo print of all models	
	✣ Creo print of all drawings	
	✣ Creo **COLOR** print of assembly (2 or more positions)	
	✣ Interference check display printout showing no interference	
	✣ DIPS for each model and assembly	
	✣ One page **(maximum)** commentary of your project work.	
4	**Soft copy of all models + drawings uploaded in zipped folder to Moodle**	2 points
5	**Judges' (two judges) grade from 1nn0vat1on™ showcase event**	15 points
Note: Your team presentation will be on Dec 10th, 2019.		

LIST OF PLANNED LECTURES OTHER THAN CREO MODELS

#	LECTURE	DESCRIPTION
1	Module 01	Syllabus
2	Module 02	Engineering Ethics – Hand-out and Review
3	Module 03	3D models – CREO Parametric 6.0 – DIPS – Numbering system
4	Module 04	Lines – line drawing techniques – free hand sketching – constructions
5	Module 05	Engineering Geometry – introduction to projection –isometric view -multiview
6	Module 06	Visualizing multiview drawings - projections
7	Module 07	Fundamental views of edges, and planes for visualization
8	Module 08	Multiview representation for sketches – ANSI Standards for multiview drawings
9	Module 09	Visualization for design – multiview drawing visualization
10	Module 10	Detail dimensioning techniques
11	Module 11	Auxiliary views: projection theory, classifications, applications, & CAD
12	Module 12	Pictorial, axonometric and perspective projections, isometric assembly drawings
13	Module 13	Section views: Basics - Techniques and conventions
14	Module 14	Geometric dimensioning and tolerancing (GDT)
15	Module 15	Tolerance representation
16	Module 16	Materials, finishes and assembly
17	Module 17	DFM, DFI, DFA
18	Module 18	Working drawing and assemblies
19	Module 19	CAD, CAE, CAM, design automation, concurrent engineering, product design
20	Module 20	Reverse Engineering as a learning tool

Note: The intention to cover as many of these lectures as possible -